

# Gender Health Differences in West and East Germany

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## Abstract

Germany was divided for more than forty years and therefore provides a setting for analyzing long-term effects of different socioeconomic and political environments on health. While divided, populations in the East and West developed a significant gap in life expectancy. In the years following the reunification the gap in life expectancy narrowed due to a remarkable increase in life expectancy of East Germans. The German reunification of 1990 offers a natural experiment on the gradual evolution of health differences in subsequent years, as living conditions in East and West became more alike. Here, we explore changes in gender differences in health and life expectancy across regions in the German population using the German Socio-Economic Panel (SOEP) between 1990 and 2013. Panel regression techniques are used to identify health satisfaction trends after German reunification. Our findings suggest a higher gender health gap in East Germany than in West Germany after reunification. In both East and West, this significant health differences in favor of males diminishes and disappears over time. Generally, it seems that East German males who stayed in East Germany have a health disadvantage which can be explained by socio-economic factors.

*Keywords:* Gender Health Gaps, German reunification, Health satisfaction, German Socio-Economic Panel

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## 1. Introduction

German reunification can be described as a "natural experiment", with a shared culture and historical background but very different political and socioeconomic conditions (Vaupel et al., 2003; Luy, 2004). As Germany was divided for more than forty years, it provides a setting for analyzing the effects of different socioeconomic and political settings on health and mortality. In the two and a half decades since reunification, the former life expectancy disadvantage of East Germans has disappeared for women and narrowed considerably for men (HMD, 2016). Myrskylä & Scholz (2013) show that middle-aged women in the former East Germany have today even lower mortality than in the West.

Several studies attributed the narrowing gap in life expectancy to equalizing living conditions, adapting health behaviors or improving health care (Nolte et al., 2000, 2002; Kibele, 2012; Vogt & Vaupel, 2015), which also could imply a decline in health inequalities between West and East Germany.

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Existing literature analyzing health differences between West and East Germans focus on economic factors and their impact on health (i.a. Roeding et al., 2013; Razum et al., 2008). Frijters et al. (2005) report evidence for a positive effect of income changes on health satisfaction. In a comparison of the impact of welfare states (Sweden, West and East Germany) on health, Miething et al. (2013) find similar levels of income-related poor health, but they also note that specific circumstances with respect to social stratification are still different in East Germany. Further, Eibich & Ziebarth (2014) show that regional economic factors such as community income or the labor market have a strong and significant association with individual health.

There is also evidence for an adaptation process between East and West Germany. For example Apfelbacher & Kraemer (2008) show that the prevalence of obesity increases for five to seven-year-old children significantly in both East and West Germany. They explain this result as an effect of a rapid adoption of a western lifestyle in the East. Westphal & Doblhammer (2012) analyze smoking prevalences in both regions and demonstrate an increasing female prevalence for East Germany after reunification.

However, in the literature little attention has been paid to gender health differences between both regions. This is somewhat surprising because results of cross-national comparisons of sex differences in health and survival show significant varying gender health gaps depending on the region (i.a. Oksuzyan et al., 2014; Lindahl-Jacobsen et al., 2013). Biological and genetic factors, social roles and health behavior, as well as health care utilization and lifestyle behavior are offered as explanations for these differences (Oksuzyan et al., 2008).

Our analysis seeks to contribute to this discussion and investigates for the first time whether the post-reunification changes were equally beneficial for East German women and men. In order to gain deeper insights into East-West German sex differences, we focus firstly on potential mortality disparities and secondly on gender health satisfaction from a longitudinal perspective. We hypothesize that 1) gender health differences are higher in East than in West Germany shortly after reunification as reflected by life expectancy levels in East Germany and West Germany and 2) gender health differences decrease due to an adaption process.

## 2. Data

To examine health trends after reunification and to explore the adaptation process for men and women in West and East Germany, we use panel data from the German Socio-Economic Panel (SOEP). The SOEP is a nationally representative longitudinal dataset for the population of Germany. The SOEP was initiated in West Germany in 1984. Since then it has been conducted annually and includes detailed personal, social and economic information for all household members above the age of 16 (Wagner et al., 2007). A sample of East German households was added in 1990. Because of this our analyses are restricted to 1990 and after. We define *East* and *West Germans* by using the retrospective

question about the place of residence in 1989. This allows us also for refreshment samples to identify residents from the former German Democratic Republic (East Germany) or the Federal Republic of Germany (West Germany). Migration between West and East Germany after reunification can be assessed by using the retrospective question about the place of residence in 1989 and annual information about the current place of residence.

An important feature of our analysis is that we consider potential selective out-migration effects. As between 1991 and 2014, 3.4 million East Germans migrated to West Germany and 2.2 million West Germans migrated to the East, which on balance means a loss of 1.2 million inhabitants for East Germany (Statistisches Bundesamt, 2015). Further, young and skilled, among them a high proportion of women, migrated from East to West, whereas elderly people, persons in need of care and the low-skilled tended to stay behind (Razum et al., 2008). We assume that for those who migrated from East Germany to West Germany the adaptation process occurred faster than for those who stayed in East Germany. To avoid selective out-migration effects, we focus on those, who have never migrated.

*Key Measure.* The measure of health that we use, and which is available for all individuals in the SOEP data in all years, is self-assessed health satisfaction. Respondents were asked "*How satisfied are you at present with your health situation?*". Answers are recorded on a scale of 0 (very unsatisfied) to 10 (very satisfied). Health satisfaction is strongly associated with general health and physical health measures (Butterworth & Crosier, 2004) and closely corresponds to self-assessed health (Frijters et al., 2005), which is commonly used as a proxy for assessing respondents health status and is considered to be a reliable measure for general health (Martikainen et al., 1999) and a good predictor for future morbidity and mortality (DeSalvo et al., 2006; Idler & Benyamini, 1997). To measure the internal consistency between the variables *health satisfaction* and *self-assessed health* we conduct factor analysis for our sample. The result suggests a Cronbach's alpha coefficient of 0.873 which indicates an adequate internal consistency ( $> 0.7$ ) (Terwee et al., 2007).

*Other Variables.* In addition to descriptive findings for health satisfaction we explore results of random effects regression. While health satisfaction is measured on an ordinal scale and thus may seem to require corresponding models, linear models are usually found to give similar results to discrete choice models and are easier to interpret (Ferrer-i-Carbonell & Frijters, 2004; Dudel et al., 2016).

Sex is the main variable of interest, which is included as a dummy (female as reference). To explore changes in health satisfaction over the years after reunification, we control for time as a continuous variable (time = year - 1989). Further, we distinguish between those, who were living in 1989 in East or in West Germany and exclude those, who migrated from East Germany to West Germany after German reunification due to selection effects.

We control for several other variables. We include age using dummy variables and restrict our data to the working age group between 20 and 59 years old. The reason is the u-shaped age attrition

pattern, which reflects higher non-response in the very young and older respondents (Lipps, 2009). With the focus on working age we try to reduce the risk of diseases as an attrition cause which could affect the results. Table 5 (in appendix) shows that health satisfaction does not significantly change for those who drop-out in comparison to those who remain in the panel. We divide age in four categories: (i) 20 to 29 (reference category), (ii) 30 to 39, (iii) 40 to 49 and (iv) 50 to 59.

The logarithmic net equivalent income (as a continuous variable), employment status and education representing the socioeconomic characteristic of the households. We subdivide employment status into five different categories: (i) full-time, (ii) part-time, (iii) marginal employment<sup>2</sup>, (iv) in education and (v) being not employed<sup>3</sup> (reference category). We include education in three categories: (i) low (ISCED 0–2) (ii) middle (ISCED 3–4) (reference category) and (iii) high (ISCED 5–6).

### 3. Results

#### 3.1. Descriptive Analysis

In the first part of analysis, we show the development of mortality differences by sex in East and West Germany. Figure 1 depicts the risk of death for East German men at different ages relative to East German women. It becomes obvious that over almost all ages men experience a higher risk of death which is most pronounced at adolescent ages. Apart from this general mortality pattern, we observe a widening of mortality differentials after reunification. The relative risk of death for men started to increase already during the 1970s and 1980s but rose sharply for all age groups between age 25 and 65 around reunification. This does not mean that mortality worsened as the East German male life expectancy caught up to the western level. It shows that East German women witnessed larger mortality improvements than East German men.

While East German’s mortality was clearly affected by reunification, we cannot find a similar pattern for West Germans. Figure 2 shows the relative risk of death by age for West German men and women. We observe a pronounced male mortality disadvantage for adolescent ages and persistent higher mortality levels around retirement ages. Unlike in East Germany, men’s relative higher risk of death is remaining constant around reunification and only declining for older ages around the year 2000.

The question remains whether the widening gender mortality differentials in the East are reflected by diverging levels of health satisfaction. Figure 3 shows sex specific health satisfaction trajectories for West and East Germans by four age groups. The figure illustrates at the first y-axes the mean value of health satisfaction (for men in blue and for women in red). In order to show changes of sex differences

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<sup>2</sup>The expression does not refer to specific working hours per week/month, it refers to a maximum monthly wage of 450€

<sup>3</sup>Besides individuals that are unemployed and looking for a job, the latter also covers military and community service, maternal leave as well as persons in partial retirement who are not working anymore.

Figure 1: Male/ Female Mortality Risk Ratios by age for East Germany, 1956-2011  
(Note: White areas show missing values)

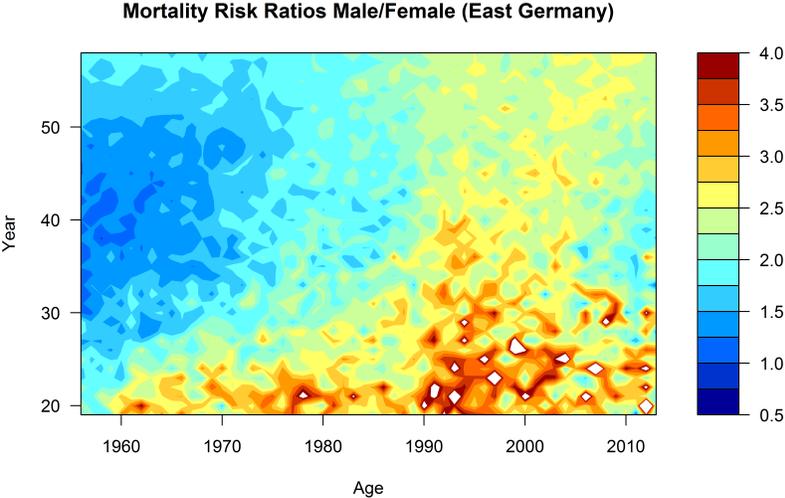
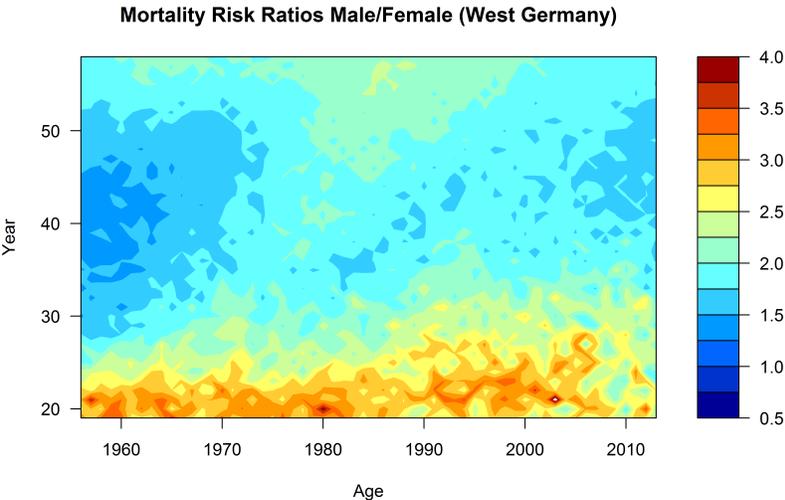


Figure 2: Male/ Female Mortality Risk Ratios by age for West Germany, 1956-2011  
(Note: White areas show missing values)



over time, the second y-axis depicts the male/female differences in health satisfaction for each year (black line). The horizontal line at 0 highlights the level of no sex differences in health satisfaction, values above ( $>0$ ) outline a male advantage, while values below ( $<0$ ) show a female advantage in health satisfaction.

The view across all eight single figures demonstrate that the level of health satisfaction changes with the age group. The higher the age group the lower the level of health satisfaction in both, West and East Germany. Furthermore, we can observe that West Germans have a higher level of health satisfaction in the age groups of 40-49 and 50-59 in comparison to East Germans. Whereas, for the younger age groups of 20-29 and 30-39 the level of health satisfaction of East Germans is higher than West Germans' health satisfaction after reunification but decreases then recently after 1990 until the mid and end 1990's. This drop of health satisfaction is observable for all age groups of the East German sample and is particularly high for the 30-39 and 40-49 years old.

By comparing sex differences in health satisfaction, the graphs show differing levels and trajectories of sex differences. With the exception of the 20-29 years old West Germans, the graphs show an obvious gender gap in health satisfaction in favor of men after the reunification. This gender gap in health satisfaction is particularly high for the age groups of 40-49 and 50-59 and higher in East Germany than in West Germany. There is a clear pattern of a narrowing gender health gap for the most age groups over the time. While the gender health gap disappears in West Germany for the 40-49 and 50-59 years old, there is even an overlap of sex differences in East Germany with the result of a female health advantage. Figure 3 demonstrates that the level and trajectories of health satisfaction vary regarding the age and the region. There are fluctuated gender gap trajectories but overall we can point out a decline in gender health gap.

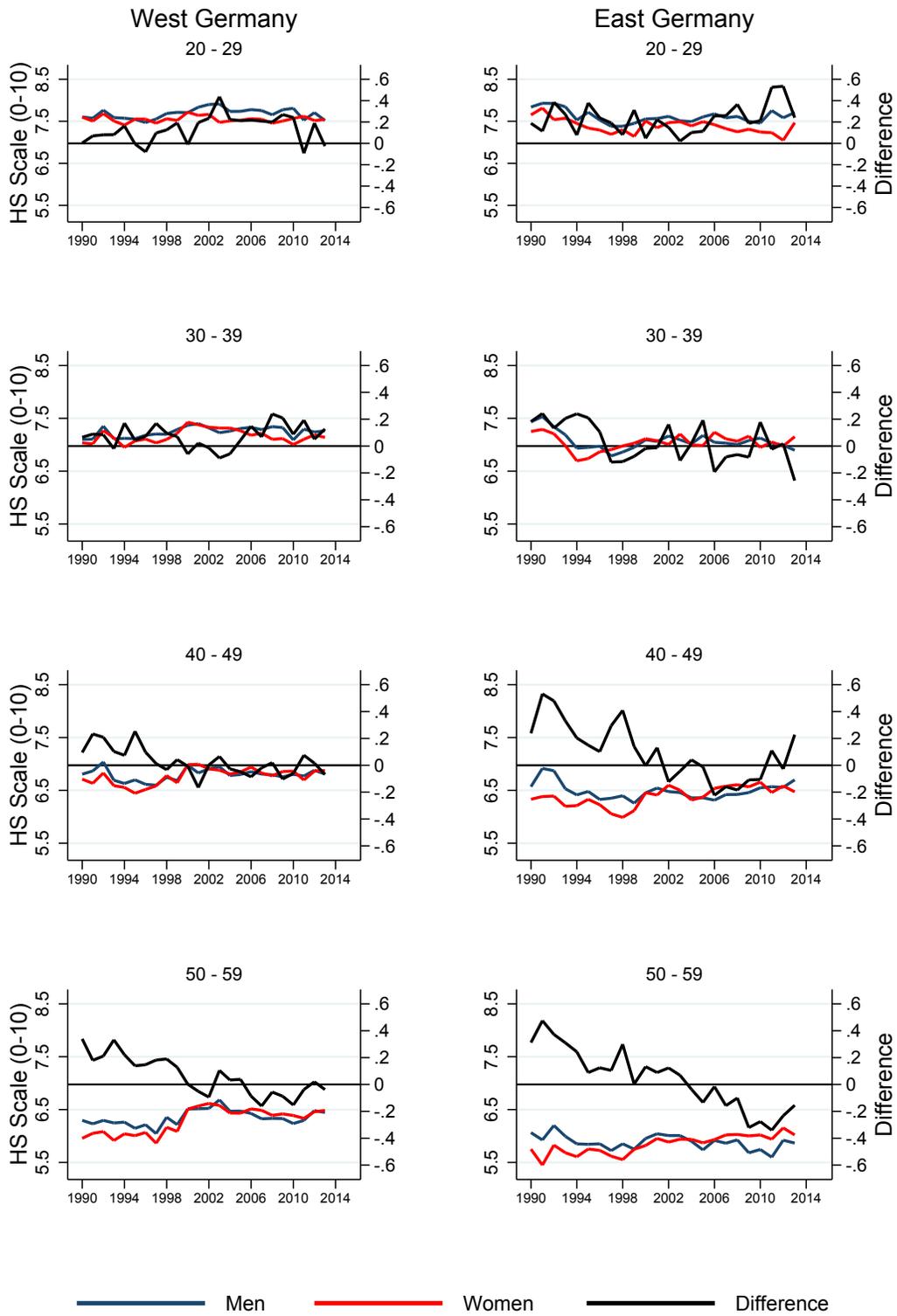
### *3.2. Multivariate Analysis*

Table 1 shows the results of the random regression (RE) models. We conduct separate models for West and East Germany with the aim to distinguish between regional specific determinants on health satisfaction. The models control for age, employment status, income, and education.

The results suggest that women have a significantly worse health satisfaction than men in West and East Germany. However, the gender health gap in East Germany is higher than in West Germany. Furthermore, the results show a negative period effect. The health satisfaction of respondents declines over the time. The effect of time is again for East Germany higher than for West Germany. The interaction term of sex and time allows us to disentangle the negative period effect by sex. The results suggest a significant positive effect for women. That means that the health satisfaction of women declines less steeply over time in comparison to men.

The coefficients for the control variables are in the expected direction: Age has a negative effect on health. The higher the age group the higher the negative effect on health satisfaction. The socioeconomic controls suggest a positive effect of being employed (full-time or part-time) or being

Figure 3: Health satisfaction trajectories and sex differences in health satisfaction



in education. Furthermore, the net equivalent income and higher education have a positive impact on health (education not significant for East Germany).

Table 1: Estimation with sex and time interaction for East and West Germany (1990-2013)

	West Sample		East Sample	
Female	-0.14**	(0.05)	-0.25***	(0.07)
Time	-0.01*	(0.00)	-0.04***	(0.01)
Time <sup>2</sup>	-0.00***	(0.00)	0.00	(0.00)
Female × Time	0.01***	(0.00)	0.02***	(0.00)
Age (reference: 20-29)				
30-39	-0.31***	(0.02)	-0.42***	(0.03)
40-49	-0.62***	(0.03)	-0.89***	(0.04)
50-59	-0.97***	(0.03)	-1.32***	(0.05)
Employment status (reference: non-employed)				
Full-time	0.14***	(0.02)	0.22***	(0.03)
Part-time	0.08**	(0.03)	0.15***	(0.04)
In education	0.13**	(0.04)	0.22***	(0.06)
Marginally	0.07*	(0.03)	0.02	(0.06)
(log) net equivalent income	0.20***	(0.02)	0.21***	(0.03)
Education (reference: ISCED 3-4 Middle)				
ISCED 0-2 Low	-0.11***	(0.03)	-0.11	(0.06)
ISCED 5-6 High	0.13***	(0.03)	0.02	(0.04)
Constant	5.75***	(0.18)	5.71***	(0.31)
Observations	119144		50300	
R <sup>2</sup>	0.06		0.1	

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

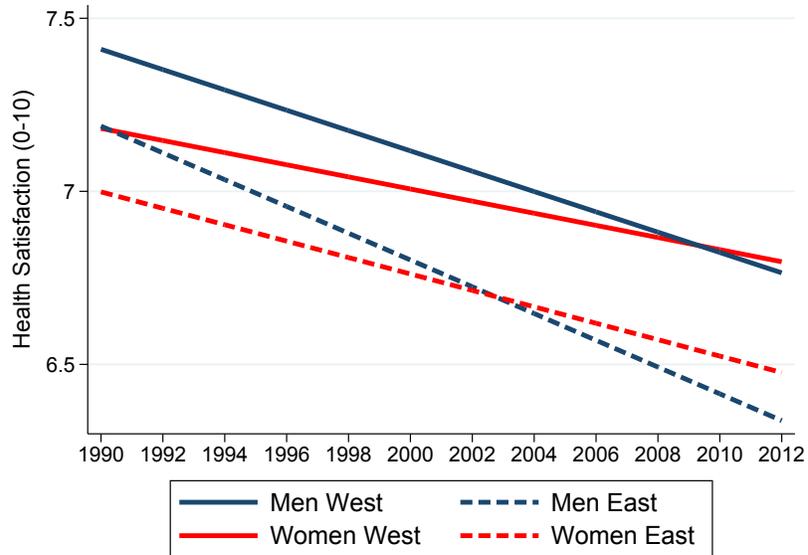
Figure 4 presents the predicted health satisfaction based on the random effects model for the West and the East German sample with the interaction term of sex, region (West and East Germany) and time (see model with coefficients in appendix table 2). The graph shows the trajectories for women in red, men in blue, West Germans in solid and East Germans in broken lines. The special feature of this figure is that it illustrates not only the trajectories of health satisfaction but also outlines the trajectories of regional differences and sex differences of health satisfaction.

There is a slightly decreasing trend of health satisfaction from less than -0.5 for women until approximately -0.7 for men in over 23 years. Among all subgroups East German men have the highest drop in health satisfaction. Furthermore, the figure illustrates that the level of health satisfaction is higher for West Germans than for East Germans. Unlike reported results from literature (eg. Roeding et al., 2013; Razum et al., 2008), the regional gap in health seems even to widen over time particularly among men.

In contrast to the regional gap, we observe a diminishing gender gap in health satisfaction after the reunification. This trend occurs due to a higher drop in health satisfaction for men than for women. The figure shows an overlap in gender gap and then a female advantage in health satisfaction in West and East Germany. However, there are differences in timing of overlap and the extent of

female advantage between West and Germany.

Figure 4: Predicted health satisfaction in East and West Germany, Random Effects



#### 4. Discussion

We use two different data sources to analyze gender gaps in health and life expectancy. The results for life expectancy suggest apart from the general mortality pattern – men experience a higher risk of death – that there is a widening of mortality differentials for East Germans after reunification, while there is no similar pattern for West Germans. This widening mortality gap can be explained by the larger mortality improvements of East women than East men.

For the analyzes of gender gaps in health we use a long panel study. The health satisfaction trajectories from 1990 until 2013 show in the descriptive findings fluctuated and regarding the age groups of the respondents varying results. The random effects models suggest a general slightly declining trend in health satisfaction but a greater drop for men particularly from East Germany. The comparison of West and East Germany shows in the descriptive part that regional differences in favor of West Germans are observable for the older age groups but not for the younger respondents. However, the predicted health satisfaction illustrate a small (for women) and a large (for men) widening health gap between West and East Germans.

The trajectories of sex differences in health indicate a declining trend of gender gaps in health satisfaction in the descriptive findings and an overlap of gender gap in health in the estimation models. The results show a clear *female advantage* for the East German sample. While we explain the widening mortality gap by a larger life expectancy improvements of East women than East men, these

findings can be described by a worsening health satisfaction of East men in comparison to East women. Therefore, it is not an advantage in the sense that women improve their health, it is rather that men have a steeper decline in health.

This East German men disadvantage in health satisfaction could indicate the economic change in East Germany and the stressful situation of adaption recently after the reunification with long lasting effects on health for older age groups.

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## Appendix

Table 2: Random-effects regression with sex, region and time interaction

	West and East Sample	
Female	-0.17***	(0.04)
Time	-0.02***	(0.00)
East in 1989	-0.17***	(0.04)
Men East $\times$ Time	-0.02***	(0.00)
Women East $\times$ Time	-0.01*	(0.00)
Men West $\times$ Time	-0.01***	(0.00)
Age (reference: 20-29)		
30-39	-0.34***	(0.02)
40-49	-0.70***	(0.02)
50-59	-1.08***	(0.03)
Employment status (reference: non-employed)		
Full-time	0.16***	(0.02)
Part-time	0.10***	(0.02)
In education	0.17***	(0.04)
Marginally	0.07**	(0.03)
(log) net equivalent income	0.20***	(0.02)
Education (reference: ISCED 3-4 Middle)		
ISCED 0-2 Low	-0.11***	(0.03)
ISCED 5-6 High	0.09***	(0.02)
Constant	5.83***	(0.16)
Observations	169444	
R <sup>2</sup>	0.07	

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 3: Attrition and health satisfaction: 20-59 years old

	Mean	Sd	N
Male			
Remain in Panel	6.76	2.13	4,609
Drop-out	6.92	2.10	5,675
Death	4.51	2.91	315
Female			
Remain in Panel	6.77	2.14	5,158
Drop-out	6.90	2.10	5,640
Death	3.99	2.97	179